# DESIGNER BABIES

## ABSTRACT:

Lately, the idea of designer babies has sparked intense public debate and scrutiny. This concept involving using cutting - edge genetic technologies. Now the disposal powerful tools of molecular biology, bioinformatics and biotechnology to create designer babies. 'Designer Babies' as the name suggests they are tailor made embryos, which have desired characteristics made in combination of pre – implantation diagnosis with specific gene markers. These markers can identify disease like genes and non-disease like genes. The advent of CRISPR-Cas9 technology revolutionized genetic editing, offering scientists a more efficient way to target specific genes and make modifications compared to previous methods. However, it is crucial to recognize that genetic engineering is still evolving and numerous technical, ethical, and safety challenges must be addressed before designer babies can become a commonplace practice. This article highlights the ethical considerations involved in using CRISPR-Cas9, PGD, and IVF in the pursuit of

designer babies and regulatory frameworks and policy considerations surrounding these reproductive technologies. It also acknowledges the potential benefits, such as the prevention of genetic diseases, but underscores the significance of responsible research and regulation to ensure that these technologies are employed ethically and in line with societal values.

**(‘ Sanjay saravanan . et al 7 july , 2023)**

**(‘Sourav Dutta . et al 2021)**

## KEYWORDS:

Genetic engineering , gene therapy , in vitro fertilization , designer babies , bioethics , CRISPR Cas 9 , pre implantation genetic diagnosis, ethical considerations, Eugenics.

## INTRODUCTION:

In 2004 , The Oxford Advanced Learner’s Dictionary introduced the term ‘ Designer Babies’ into their repository. It defines the term as:

‘ A baby that is born from an embryo that was selected from a number of embryos produced using IVF , in order to ensure the baby has or does not have particular genes that can transfer per cause disease.

**(‘ Goutum Roy Chowdhry . et al 2021).**

Designer babies refers to babies whose genetic makeup has been intentionally modified or enhanced through genetic engineering techniques. This concept involves altering the genetic material of an embryo or fetus to introduce specific traits or characteristics before birth. (S.Sanjay-et al. 2023). It is the next step to cosmetic surgery as pointed out by biotechnology critic **Jeremy Rifkin.** to understand the concept of designer babies , first we have to understand the concept of ‘ **Eugenics**’( the practice of selective breeding of human species by mating individuals with superior hereditary traits). Eugenics has its history in the work of Greek philosopher Plato , who is credited with coming up the concept of better creation.

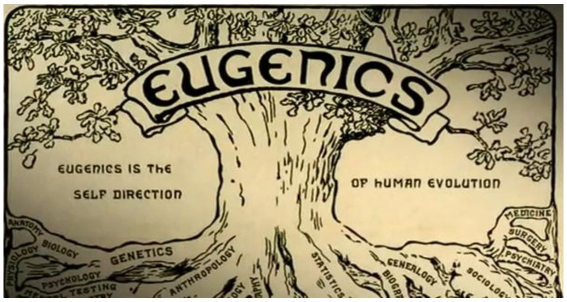
**AYVRVEDA (** mentions the methods of practice for procurement of healthy offspring’s.)

**DARWIN , SPENCER (** explained about internal traits / genotypes )

**FRANCIS GALTON** (coined the term eugenics )

**Eugenics** came to be known as the misapplication of genetic engineering. Countries like Canada have passed laws, which on one hand has enabled screening of embryos for determination of diseases and disabilities but on the other have also curbed commercialization of human genetics and reproductive technologies. The potential benefits of designer babies include the prevention of genetic diseases, the enhancement of desirable traits, and the potential to improve overall human health and well-being. For example, genetic modifications could be used to eliminate or reduce the risk of certain hereditary conditions or predispositions to diseases.

(S.Sanjay- et al 2023+ Sourav Dutta-et al 2021)



## MAINBODY:

## Frontier Research:

Dr. Jeff Steinberg pioneered the technique of In vitro fertilization abbreviated IVF in the 1970s creating what came to be known colloquially as ‘test tube babies’. In IVF, fertilization of the egg and the sperm is attained in in vitro conditions and several embryos are formed, which are then placed back into the womb for development. Although successful pregnancy rate is 10-35% , these techniques came as a boon for couples who had complications in conceiving. Dr. Steinberg further modified the process to screen for selective traits using biomarkers. These biomarkers can be generated for desirable traits for e.g. eye color, hair color to more complicated traits e.g. serious genetic disorders and disability recognition the likes of which include Down’s syndrome, muscular dystrophy, cystic fibrosis, sickle cell anemia, etc. Assisted reproduction has opened the possibilities of pre-implantation diagnosis for identification of common and complex genetic disorders in embryo. Pre-implantation genetic diagnosis (PGD) also offers techniques to screen embryos for selective markers to specific genetic attributes prior implantation. (‘Goutum Roy Chuhdry –et al 2021).

**Brave New World** has become the inevitable reference point for all media discussion of new advances in reproductive technology. Whether it’s Newsweek reporting in 1978 on the birth of Louise Brown, the first “test-tube baby” (the inaccurate phrase speaks volumes) as a “cry round the brave new world”, or the New York Times announcing “The brave new world of three-parent IVF” in 2014, the message is that we are heading towards Huxley’s hatchery with its racks of tailor-made babies in their “numbered test tubes. Every new advance puts a fresh spark of life into Huxley’s monstrous vision. Ishiguro’s dire forecast was spurred by the gene-editing method called Crispr-Cas9, developed in 2012, which uses natural enzymes to target and snip genes with pinpoint accuracy. Thanks to Crispr-Cas9, it seems likely that gene therapies – eliminating mutant genes that cause some severe, mostly very rare diseases – might finally bear fruit, if they can be shown to be safe for human use. Clinical trials are now under way.

But modified babies? Crispr-Cas9 has already been used to genetically modify (nonviable) human embryos in China, to see if it is possible in principle – the results were mixed. ( Phillip Ball – 2017)

## Steps involved in creating Designer Babies:

- **In-vitro fertilization (IVF):** In-vitro fertilization (IVF) is a medical procedure that involves fertilizing an egg with sperm outside the human body in a laboratory setting.

- **Pre-implantation genetic diagnosis (PGD):** Pre-implantation Genetic Diagnosis (PGD) is a reproductive technology used in conjunction with in vitro fertilization (IVF) that allows for the genetic screening of embryos before they are implanted in the womb. After a few days of development, when the embryos are at the 8-cell stage, a few cells are removed for genetic testing. Only embryos with the desired traits would be selected for further development.
- **Genetic modification**: Genetic modification, also known as genetic engineering, involves intentionally altering an organism’s genetic material to introduce or modify specific genes or traits. Once the desired embryos have been identified through PGD, specific genetic modifications can be made.
- **Embryo implantation:** After genetic modifications are made, the selected embryos would be cultured in a laboratory to allow them to develop further.
- **Pregnancy and Birth**: The pregnancy would proceed as in a normal IVF pregnancy, with regular monitoring and medical care. The baby would be born and would potentially possess the desired genetic modifications. (N. Hari prasath- et al 2023).

  Scientists at the Oregon Regional Primate Research Center have developed a genetically engineered rhesus monkey named **ANDi** with bioluminescent genes from jellyfish.

## World's First Designer Baby:

The world's first 'Designer Baby' or 'Donor Baby', Adam Nash was born in the year 2002 through pre-implantation process. The embryo chosen was one which did not have the disease-causing gene responsible for Fanconi's anemia, a disease that plagued Adam's elder sister Molly. At the time of birth, Adam's cord blood was collected and transplanted into his sister. Thus Adam was the first success story in the largely unexplored albeit controversial domain of 'Designer Babies'

(Goutum Roy Chuhdry- et al 2021)

Brave New World has become the inevitable reference point for all media discussion of new advances in reproductive technology. Whether it's Newsweek reporting in 1978 on the birth of Louise Brown, the first "test-tube baby" (the inaccurate phrase speaks volumes) as a "cry round the brave new world", or the New York Times announcing "The brave new world of three-parent IVF" in 2014, the message is that we are heading towards Huxley's hatchery with its racks of tailor-made babies in their "numbered test tubes.'' (Phillip Ball 2017)

# DISCUSSION:

## Pros and Cons of designer babies:

| **Pros** | **Cons** |
|---|---|
| Parents have the option to select desirable qualities in their offspring's. | Unethical |
| Offspring gender can be chosen. | Gender inequality |
| Prevention of genetic disorders. | Off target effects |
| Reduction of illness risks in future. | Only available to rich. |
| provide good impact on offspring. | Affect gene pool. |
| Contribute to genetic engineering. | Effects due to deleted genes. |
| Assist in the prevention of mitochondrial diseases. | People with impairments will be marginalized. |
| Prolonged life expectancy. | Widens the social gap. |

| | |
|---|---|
| Discrimination prevention and assistance for individuals with disabilities. | Infringes on infants rights. |
| Exercise early control over offspring lifestyle. | Many genetic diseases remain unsolved. |

(Goutum Roy Chuhdry –et al 2021)

# ETHICAL CONSIDERATIONS:

Numerous ethical questions are raised by the idea of "designer babies", which refers to genetically altering embryos or choosing particular traits. These include concerns about equity, consent and autonomy, unintended consequences, slippery slope, commodification of children, medicalization of reproduction, and ethical considerations for genetic editing. ( S.Sanjay- et al 2023) . The conceptual idea of parents shopping for their future baby characteristics and traits have invoked a lot of ethical conundrum and the idea stands controversial. There are many questions to answer . Can the concept be morally defended? Should parents be permitted to that ? also the abortion and pre implantation diagnosis is considered illegal. ( sourav dutta-et al 2023) The term 'Designer Babies' have also been argued to make a commercial and tailored feel to it. It is often the case that popular scientific discourses are over-simplified and made lucrative by specialist scientists to

gain the attention of the non-specialist masses by making them more comprehensible.

(sourav dutta et-al 2023).

- **Consent and Autonomy:** Consent and autonomy are fundamental ethical considerations when discussing designer babies or any form of genetic modification. The ability to make decisions about our own bodies and genetic makeup is a cornerstone of individual autonomy. Genetic modifications made to embryos raise questions about informed consen.
- **Commodification of Children:** The creation of saviour siblings may be seen as treating children as commodities or objects to fulfill the needs of other. Birth parents, surrogate mothers, and donors who could be focused on financial gain rather than genuine care and concern for the child's well-being.
- **Unintended Consequences:** Genetic modifications, although intended to enhance certain traits or prevent disorders, can have unforeseen effects. The long-term implications of such unintended consequences raise questions about the ethical responsibility of altering the genetic makeup of individuals without fully comprehending the potential risks and ramifications. These unintended consequences could result in the form of unexpected health

issues, genetic abnormalities, or alterations in traits that were not intended to be modified.

- **Slippery Slope:** The worry is that the initial goals of enhancing health or eliminating genetic disorders will eventually end up in a culture obsessed with producing "ideal" or genetically superior people. The slippery slope argument suggests caution and careful analysis of the potential outcomes that may result from continuously pushing the limits of genetic modification.
- **Stigmatization and Discrimination**: The idea of designer babies raises serious ethical issues related to discrimination and stigmatization. People who naturally exhibit particular features may become stigmatized if those traits are viewed as undesirable or if they are preferred over others. By dividing people between those who have undergone genetic modification and those who have not, this could increase negative biases and prejudices in society.
- **Medicalization of reproduction**: The concept of designer babies raises concerns about the medicalization of reproduction, where the process of creating a child becomes heavily influenced by technological interventions. The medicalization of reproduction in designer babies challenges our fundamental

understanding of what it means to bring new life into the world.

- **Ethical Considerations for Gene Editing:** The technical challenges and ethical considerations associated with gene editing, such as the potential for off-target effects and the risk of inadvertently introducing harmful mutations, need to be carefully addressed before widespread implementation. (S. Sanjay et al - 2023)

# Conclusions:

To conclude the discussion, I would suggest that the modification of human embryo should be done to remove genetic disorders to prevent our future generations from the impacts they had due to their inheritance. But they should not be manipulated to bring inequality in the world . But the experiments can be done for research purposes or another idea is that Designer Babies can be produce for assistance in some fields like Artificial Intelligence , Robotic engineering etc. where human IQ level is needed to explore things. But they should not be introduced in the society as it will raise many ethical, socioeconomic issues. But at the end Technology can be used for the assistance of human beings but not as a replacement of human beings.

## FUTURE DIRECTIONS:

- The CRISPR technology can be used to edit genes for inherited disorders which can protect us against the effects of aging.
- It can be used to create **Super people.**
- It will create designer babies which have specific physical and mental characteristics.
- Treat infertility and other reproductive issues.
- Germ line editing that will pass to future generations.

## RESEARCH LIMITATIONS:

- The technology is still in early stages, so not well developed.
- It can cause miscarriage / serious harms to mother.
- This process is very expensive, only rich people can afford it.

- The process can cause damage to gene pool.
- This process can cause loss of some beneficial genes.